WHAT IS CLAIMED IS:

1. A optical router comprising:

a plurality of input ports;

a plurality of output ports;

an add port for inputting data received from a lower Internet protocol (IP) router;

a drop port for outputting data to the IP router;

a wavelength division demultiplexer arranged to wavelength-division-demultiplex wavelength signals input through the input ports and the add port;

an input interface arranged to convert optical frames input from the wavelength division demultiplexing section into electrical signals and also converting the electrical signals to optical frames;

an optical switch for performing a high-speed switching of the optical frames output from the input interface;

an output interface arranged to process the optical frames switched by and output from the optical switch;

a wavelength division multiplexer arranged to wavelength-division-multiplex outputs of the output interface section and transmit the multiplexed outputs to another optical router;

a drop interface arranged to process the optical frames output from the wavelength division multiplexer to the IP router;

a header processor arranged to recognize header information and to control the

optical router;

an optical switch controller arranged to control a connection state of the optical switch for switching the optical frames;

a header reinserter arranged to reinsert headers into outputs of the optical router; and

an edge traffic aggregator including of an ingress part for converting IP packets input from the IP router into optical frames and an egress part for converting the optical frames into IP packets and transmitting the converted packets to the lower IP router.

2. The optical router as claimed in claim 1, wherein the wavelength division demultiplexer includes a plurality of wavelength division demultiplexers.

3. The optical router as claimed in claim 1, wherein the input interface comprises:

an optical receiver arranged to convert an optical frame input from the wavelength division demultiplexer into an electrical signal;

a buffer coupled to the optical receiver arranged to store the electrical signal for synchronization;

a header length detector coupled to the optical receiver and the buffer arranged to extract a header length in order to separate a header from the electrical signal;

a switch coupled to the buffer arranged to separate the header and data from the electrical signal;

a queue coupled to the switch arranged to store data separated by the switch;

an optical transmitter coupled to the queue arranged to restore the electrical signal an optical frame in order to transmit the data to the optical switch;

a header processor arranged to read an address with reference to the header of the electrical signal and determine a header output time; and

a header reinserting section arranged to insert a new header output from the header processor.

4. The optical router as claimed in claim 3, wherein a predetermined guard time is provided between the header separated from the switch and the data frame in order to prevent data loss when the header and the data frame are separated.

5. The optical router as claimed in claim 3, wherein the queue of the input interface comprises:

a plurality of electric switches arranged to switch the input data by destinations;

a plurality of buffers arranged to receive and store the data by destinations to accumulate a predetermined amount of data; and

a combiner coupled to the plurality of buffers.

6. The optical router as claimed in claim 5, wherein the plurality of buffers include at least one buffer for each possible destinations.

7. The optical router as claimed in claim 1, wherein the input interface comprises:

an optical receiver arranged to convert optical frames input from the wavelength division demultiplexer into electrical signals;

a buffer coupled to the optical receiver and arranged to store the electrical signals;

a header length detector coupled to the optical receiver and arranged to extract a header length in order to separate headers from the electrical signal;

a switch coupled to the buffer and arranged to separate the headers and data from the electrical signals;

a queue coupled to the switch and arranged to store data separated by the switch;

a plurality of optical transmitters arranged to input data from the queue and to restore the electrical signals to optical frames in order to transmit the data to the optical switch;

a header processor arranged to read addresses with reference to the headers of the electrical signals and deciding header output times; and

a header reinserting section arranged to insert new headers output from the header processor.

8. The optical router as claimed in claim 7, wherein the buffer includes a plurality of outputs.

9. The optical router as claimed in claim 1, wherein the output interface comprises:

an optical receiver arranged to convert the optical data switched by the optical switch into an electric signal;

a buffer arranged to temporarily store the data for a header reinsertion;

a header reinserter arranged to reinsert the header; and

an optical transmitter arranged to transmit the optical data combined with the header to a next node.

10. The optical router as claimed in claim 1, wherein the output interface comprises:

a plurality of optical receivers arranged to convert the optical data switched by the optical switch into electric signals;

a plurality of buffer couple to the plurality of optical receivers, respectively, and arranged to temporarily store the data output from the plurality optical receivers for a header reinsertion;

a header reinserter arranged to reinsert the header; and

an optical transmitter arranged to transmit the optical data combined with the header to a next node.

11. The optical router as claimed in claim 1, wherein the ingress part of the edge traffic aggregator comprises:

a plurality of optical receivers arranged to receive packet data input from the lower IP router;

a plurality of packet processorscoupled to the plurality of optical receivers, respectively, and arranged to perform at least a packet forwarding function;

an address table coupled to the plurality of packet processors;

an electric switch coupled to the plurality of packet processors;

a data frame assembler, provided with a predetermined number of buffers, arranged to convert switched packets into the optical frames;

a controller and scheduler arranged to determine output orders and wavelengths of the optical frames generated from the data frame assembler;

an electric switch arranged to transmit the optical data of which the output order and the wavelength are determined;

a predetermined number "n" of header inserting sections arranged to insert the header before an optical modulation;

an optical transmitting section including n optical transmitters arranged to optically modulate the optical frames combined with the headers; and

a wavelength division multiplexer arranged to wavelength-division-multiplexing the optically modulated signals.

12. The optical router as claimed in claim 10, wherein the data frame assembler divides and stores the switched packets by destinations in the n buffers, and if a predetermined amount of data is accumulated, it processes the data by buffers; and

wherein the controller and scheduler detects the amount of data by buffers of the data frame assembler, and determines the output order and the wavelength of the optical frame.

13. The optical router as claimed in claim 1, wherein the egress part of the edge traffic aggregator comprises:

a wavelength division demultiplexer arranged to wavelength-division-demultiplex the wavelength-division-multiplexed optical signal dropped by the optical router;

a plurality of optical receivers arranged to convert the optical frame into the electric signal;

a data frame disassembler arranged to separate the frame in a unit of an IP packet and then separate the frame by destinations;

a scheduler arranged to control an output order of IP packets separated by destinations;

a plurality of packet processor arranged to process the IP packets through at least a forwarding process;

an address table coupled to the plurality of packet processors;

an electric switch coupled to the plurality of packet processors; and

a plurality of optical transmitters arranged to optically modulate the switched

packets.

14. The optical router as claimed in claim 1, wherein the edge traffic aggregator converts the packets input from the IP router into the optical frames of a predetermined length according to addresses of destinations, the input interface processes the optical frames through an optical/electric/optical conversion, the optical switch performs a switching of the optical frames, and the output interface processes the optical frames through the optical/electric/optical conversion again and then transmits the optical frames to a next optical router node or the edge traffic aggregator.

15. The optical router as claimed in claim 1, wherein the edge traffic aggregator has the egress part which converts the packets input from the IP router into the data frames of a predetermined length according to addresses of destinations, generates headers having a speed obtained by dividing the data frame by an integer number, and combines the headers with the data frames to transmit the combined optical frames.

16. The optical router as claimed in claim 1, wherein the edge traffic aggregator has the egress part which receives the optical data frames switched by the optical router, separates the received optical data frames by IP packets, and transmits the separated optical data frames to the IP router.

17. The optical router as claimed in claim 1, wherein the input interface includes a header length detector arranged to detect a header starting point and a header length, and a header processor arranged to separate the header and the data frame to process the data frame.

18. The optical router as claimed in claim 1, wherein the output interface section includes a header reinserting section arranged to insert a new header into the data frame switched by the optical switch.